



On-Line, Real-Time Alpha Radiation Measuring Instrument



Developer: Thermo Power Corp. (Tecogen Division)
Contract Number: DE-AR21-95MC32088
Crosscutting Area: CMST

Subsurface
Contaminants
FOCUS AREA

Problem:

The Department of Energy (DOE) must ensure that effluent waters leaving contaminated DOE sites do not affect the public's safety or health. Alpha-emitting radioisotopes, such as Uranium-238 (^{238}U)/Uranium-234 (^{234}U) and Plutonium (^{239}Pu), are rated by the U.S. EPA as class A carcinogens with very low regulated limits in water. Uranium also has a high chemical toxicity. The EPA proposed maximum concentration limit for uranium in public drinking water supplies is 20 ppb (30 pCi/l), equivalent to an emission of 58 alphas per minute in 1 liter of water. For reference, the world's sea water has a uniform uranium concentration of 3.3 ppb.

Currently, surface and ground waters at contaminated DOE sites are monitored for alpha emitters (and other contaminants) by intermittent sampling, with analysis at a central laboratory. Principal shortcomings of the current approach are that it: does not capture every spike in radionuclide levels, has high end-to-end total costs, has a long time delay between sampling and data availability, is prone to errors and mistakes due to

the multiple handling and manual processing steps involved, and requires awkward and expensive archiving of samples.



Thermo Alpha Monitor (TAM)

Solution:

Under DOE contract, Thermo Power Corporation has demonstrated a new technology which permits extremely sensitive counting of alpha emitters in water, providing high-resolution alpha spectrometry. Individual radionuclides can be assayed simultaneously, based on their

different alpha energies. This new technology provides the basis for an on-line, real-time monitor of alpha-emitting radionuclides, both for effluent streams leaving DOE sites and for process streams.

Benefits:

- ▶ No delay in obtaining accurate analyses
- ▶ Dramatic reduction in end-to-end alpha monitoring costs
- ▶ Readily and conveniently archived samples
- ▶ Isotopic analyses, allowing discrimination of naturally-occurring radionuclides (radon daughters)
- ▶ Capable of analyzing waste and process water (National Pollution Discharge Elimination System [NPDES]) discharges
- ▶ Surface and ground water monitoring, with future extension to solid samples, non-aqueous liquids, gas streams, and solid surfaces

Technology:

The technology involves a patent-pending, in situ method of collecting



